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Vagn, Anna Rose ; Clausen, Christian; Gish, Liv

Published in:
Proceedings of the 19th International Conference on Engineering Design (ICED13) : Design For Harmonies

Publication date:
2013

ICED13
INTERNATIONAL CONFERENCE ON ENGINEERING DESIGN, ICED13
19-22 AUGUST 2013, SUNGKYUNKWAN UNIVERSITY, SEOUL, KOREA

TOWARDS A NEW PERSPECTIVE OF MANAGING IDEAS IN FRONT-END INNOVATION AS ACTOR NETWORKS

Anna Rose VAGN (1), Christian CLAUSEN (1), Liv GISH (2)
1: Aalborg University, Denmark; 2: Technical University of Denmark, Denmark

ABSTRACT
For decades the innovation process in R&D organisations has been discussed. Product development processes is well-established in R&D organisations and improvements has been implemented through theories as Lean product development and agile methods. In recent decades, more diffuse processes have been identified as front-end innovation processes. The front-end innovation is distinguished from linear product development and characterised as more informal, unstructured, and unpredictable. This paper presents the preliminary results of a PhD project concerning idea management in front-end innovation of R&D organisations. Through theoretical and empirical investigations of managing activities of idea processes an indicative analysis in the perspective of actor network theory is performed. The analysis show how managers and employees navigate in a complex environment of organisational structures, technical features and design, creativity and social interaction. The analysis inputs an initial conceptualisation of a new theoretical framework of idea management. The theoretical framework suggests a dynamic network structure comprised of the dimensions of space, content, and process.

Keywords: front-end innovation, actor network theory

Contact:
Anna Rose Vagn Jensen
Aalborg University Copenhagen
Department of Development and Planning
Copenhagen SW
2450
Denmark
arvj@plan.aau.dk

1 INTRODUCTION

The front-end of innovation (FEI) in R&D organisations is considered a complex space of different interacting stakeholders striving towards developing innovative ideas into viable product concepts. In this paper we outline a preliminary framework concerning the management of idea processes in FEI of R&D organisations. The framework is based on the empirical work of the first author's PhD project, and integrates a socio-technical perspective.

During the 1990s, focus of innovation processes in R&D organisations was especially on implementing New Product Development (NPD) models (Cooper 2001), Integrated Product Development (Andreasen & Hein 2000) and Concurrent Engineering (Wheeler et al. 1991). The aim was to improve communication and integration between departments, and to optimise the NPD process. In the 2000s Lean Product Development evolved to make the NPD process leaner (Haque & James-Moore 2004). Principles of eliminating waste, the improvement of resource utilisation and front-end loading were adopted from lean manufacturing, yet limited literature is available to provide step-by-step instructions (Wang et al. 2012). Also the Scrum model has been reintroduced to improve agility and assist improving time to market compressions.

In parallel to these developments of the product development process, a focus has shifted to the early processes of the product innovation in R&D organisations, FEI (e.g. Smith & Reinertsen 1998). Reid & de Brentani (2004) distinguishes between front-end activities and traditional NPD and defines a radical innovation process with characteristics of complex decision-making in interfaces between individual levels and organisational levels. Well-known examples of representing FEI are the New Concept Development (NCD) model (Koen et al. 2002) and the Innovation Funnel (Wheelwright & Clark 1992). As ideas are the beginning of any innovation endeavour and closely related to FEI, the concept of idea management focuses on enabling management of knowledge- and decision processes in FEI to increase innovation capability (e.g. Tidd & Bessant 2009).

However, challenges arise in trying to fit FEI with generic and rigid models of idea management, which are based in traditional process management perspectives. Barczak et al. (2009) conclude that the management of ideas is a subject without stabilised consensus and managing of ideas seems to be carried out contextual and in an ad hoc manner in innovation organisations. Also, the problem of ambiguity that lies in the challenge of balancing explorative and exploitative activities (Pavitt 2005) defines the FEI. Van de Ven and Engleman (2004) identify the central management problem of pushing ideas throughout the organisation and turning them into profitable businesses as still being relevant.

In order to make the managing of ideas more consistent with FEI, we expand current understandings by bringing a socio-technical perspective into play, namely actor network theory (ANT). Our research question is as follows: How could a perspective of ideas as socio-technical networking contribute to a new understanding of management implications of idea processes in front-end innovation?

The paper is structured as follows: First we give a review of the current understandings of idea management in chapter two. In chapter three we present how we have acquired knowledge and collected data for our research. In chapter four we establish a new perspective on idea processes through actor network theory. Then in chapter five we discuss and develop the outline of a theoretical framework and finally we conclude in chapter six.

2 REVIEW OF CURRENT UNDERSTANDINGS OF IDEA MANAGEMENT

Idea management literature is primarily rooted within the area of innovation management in organisations. In a systemic perspective, Vandenbosch et al. (2006) view ideas as movement and change, cognition and knowledge, and social interaction. They describe the managerial process as recognising the need for ideas, idea generation, and evaluation. This idea management process is in variations consistent throughout the literature. Also, in information technology literature idea management is discussed in developing and investigating applications of idea management systems (e.g. Boeddrich 2004).

Idea management literature can be roughly divided into two foci: a structural focus with attention to optimisation of organisational and development processes and a social focus with attention to the interaction between people in innovating activities. Contributions with these two foci are summed up in Table 1.

Table 1

Structural focus	Social focus
• Different factors of organisational structures and culture influences the process of idea management (van Dijk & van den Ende 2002) • Certain considerations of roles and purposes can improve the process of idea management (Nilsson & Elg 2002) • Specific and general requirements is needed in order to implement an idea management system in organisations (Boeddrich 2004) • Creativity and ideas categorised as more value-focused opposite to ideas as different alternatives creates more quality ideas but demand contextual evaluation criteria (Selart & Johansen 2011) • IT systems for the sharing and storage of ideas can cross the boundaries of the organisation by integrating external groups like suppliers, costumers, competitors, and other stakeholders (Brem & Voigt 2009) • Application of idea management system in the FEI provide ideas a certain general structure which enables managers to make easier decisions between many different ideas and for colleagues to better feedback on ideas (Montoya-Weiss & O'Driscoll 2000)	• Idea management processes of capture, representation and development of ideas can be seen as essential social processes in the performance of idea management systems (Coughlan & Johnson 2008) • Informal grass root innovation processes can be supported through idea management (Bailey & Horvitz 2010) • Managerial facilitation and informality of individual and group networks influences idea quality (Björk & Magnusson 2009) • Political processes can be used in understanding creativity in relation to the organisation (Bakker et al. 2006) • Managerial implications of idea management systems can be identified in terms of customisation, attracting innovators, handling information overflow, and inadequate support of informal idea processes in the earliest stages (Hrastinski et al. 2010) • Informal promoting and bargaining of ideas in early fuzzy product development is suggested to become formalised to openly develop, evaluate and select ideas in order to make processes more accessible without compromising creativity (Hellström & Hellström 2002)

The themes of the contributions presented in Table 1 point to both formal and informal aspects of idea development processes in innovating organisations. In the reviewed literature, we see that idea processes and the managing of these processes need to be considered on both a structural level of organisational conditions and procedures and on a social level in social interaction and the creation of new knowledge. At the same time these processes shows to be both formal and indeed informal. In the work of Gish (2011), idea-promoting initiatives are examined in a company. It is argued that an idea management systems design not matching the, often informal, practices of idea processes in the organisation may have difficulties in being integrated. At the same time a system, which match practices, may not challenge practices in order to increase innovation capability. The managerial implication of the study is the interplay between the formal system and the informal practices of idea processes. The formalisation of idea processes should not be the sole focus at the expense of ways to facilitate practices and to challenge them.

It is our impression from the literature review that the informal aspects of idea processes play a significant role in innovation idea processes but it is limited how much attention in analysis and development of theoretical frameworks this has been given. The reviewed perspectives of idea management primarily focuses on structural or social aspects of managing ideas but largely on the expense of investigating the dynamics between these aspects and much on the expense of understanding how the content of ideas, being technologies, design and product specification, influences how individuals or groups understand ideas, carry ideas forward, and decides upon innovation ideas in a R&D organisational context. It is our intention is to extend the current

understandings of idea management with the use of actor network theory in order to reframe idea processes in FEI.

3 METHOD OF ACQUIRING KNOWLEDGE AND COLLECTING DATA

The acquiring of knowledge and collection of data has been gained through iterative and practicable theoretical and empirical studies.

3.1 Acquiring knowledge

The search for literature on idea management was performed in multiple databases with the truncated keywords of 'idea', 'innovation', and 'management', which resulted in a large amount of literature. The literature was qualitatively selected or rejected by title and/or abstract. The method of rolling the snowball (Bryman 2001) was used to follow interesting and relevant references, themes, or theories in selected papers, which was found in the initial database search. The criteria for selecting relevant literature was a clear focus in the selected literature on managing ideas in a R&D organisation context but with no limits in the theoretical perspectives used. The acquired knowledge offers both empirical studies and theoretical perspectives for analyses and can be mapped as creativity and conceptualisation in engineering design, organisational studies of innovation, management of creativity and innovation, and actor network theory.

3.2 Collection of data

The empirical data used in this paper stems from R&D activities in large well-established Danish companies. The companies all work on a global level and play a significant role in a demanding and uncertain environment that continuously challenges their innovation capability. The empirical data is supplied from two industrial workshops, attended by participants from five and eight different companies respectively, a questionnaire conducted in one company, and semi-structured interviews from three different companies.

The first workshop had the theme of requirements for idea management and the second workshop had the theme of challenges of idea management. The first workshop where attended by managers from department levels from five different companies. The managers were both from product development and business development departments and engaged with managing ideas in their organisation. The participants were asked to point out specific phases of idea management and define specific managerial requirements for these phases. Managers from project- and department levels from eight different companies attended the second workshop. Managers were again both from product- and business development departments engaged with managing ideas and were asked to present and discuss challenges of idea management. The workshops had duration of five hours and were recorded by video and notes.

The company questionnaire contains both open-ended and closed-ended statements and all statements are based on a Likert-type scale. A Likert-type scale collects answers from respondents on a scale from 'strongly agree' to 'strongly disagree' with the statements in the questionnaire. The statements are based on the literature search and empirical findings from the two industrial workshops and falls into five identified process phases; *Idea motivation* that concerns the motivation to consider new technology, markets and opportunities, *Ideation* that concerns the first development of ideas, *Idea presentation* that concerns the presentation of ideas to more formal and corporate structures, *Idea evaluation* that concerns feedback and steering of ideas, and finally *idea execution* that concerns the implementation and final budgeting of ideas in the corporate development structures. The respondents of the questionnaire are employees involved in innovation idea development from different functional areas such as R&D, marketing, technology development, and production. The questionnaire was returned with a response rate of circa 75% equivalent to 113 respondents. The respondents are equally female and male. The respondents cover the domains of Research and Development by 73%, Production and Operation with 18%, Administration and IT with 5%, and Marketing and Sales with 3%.

Nine semi-structured interviews with managers and employees were conducted with the focus on managing innovation and ideas in three industrial companies; one interview with an R&D director of the same company in which the questionnaire was conducted, two interviews from a radical innovation department of an industrial company, and six interviews from a company of which one were from technology development, two from business development, and three from concept development. The interviews lasted from 30 to 120 minutes.

4 IDEA PROCESSES IN THE PERSPECTIVE OF ACTOR NETWORKS

In this section a new perspective of how innovation idea development can be described as actor networks will be introduced. First, there will be a brief introduction to the perspective of ANT, then a comment on why this theoretical perspective could be useful in the context of managing ideas in FEI, and finally the empirical findings will work as illustrations and exemplifications of the perspective

4.1 Actor network theory

ANT is based within Science and Technology Studies, mainly developed by Michel Callon and Bruno Latour in the 1980's. ANT offers a number of concepts for the analysis of a network of human and non-human actors. It emphasises how the *relations* between *actors* are configured defining a certain idea or socio-technical arrangement and the processes stabilising or destabilising the network as *translation*.

In actor networks, agency can be ascribed to both human and non-human entities (Law 1992). This theoretical feature enables the analyst to address both social and technical aspects of ideas and their intimate interactions. The relations between both human and non-human actors defines the actors (Jensen 2003), so the heterogeneity and dynamic in the relation between, as an example, technical features of a design concept and human understanding and activities in relation to the design concept becomes an essential subject of analysis.

Actor networks are continuously configured and reconfigured. The process of translation describes the dynamic or the displacement of the actor network and may be characterised through four phases (Callon 1986), *problematisation*, *interessement*, *enrollment*, and *mobilisation*. In the translation process actors develops a shared interest and work together in order to create enough momentum in reaching a goal through the translation process. In the problematisation phase, an actor will make its agenda impossible for the network to disregard and thereby the network will have to respond to the agenda. In the interessement phase, an actor is made aware of the agenda by the network, and the actor will either respond positively in joining the agenda or will try to make an alternative agenda. In the enrollment phase, actors are positioned in the network with acceptance. In the mobilisation phase, the actors are actively supporting the network and give it stabilisation.

4.2 Actor network theory and idea management

When dealing with idea development in the context of technologies and innovation, as is the case, it seems highly relevant to explore a theoretical perspective that pays attention to human as well as non-human based interaction and brings socio-technical analyses to another level. In the work of Legardeur et al. (2010) the early phases of an innovative design process is investigated in the perspective of ANT to understand the complexity of social interaction in relations to new ideas and concepts. This work shows an effective way to uncover processes of ideas in the frame of managing ideas. Actor network translations and idea management are both grounded in the view of a process structure but the underlying understanding of processes is different from each other. The intention of drawing on ANT, in the analysis of idea management, is not to dismiss the generic process models of idea management but to suggest an alternative or a complementary perspective that could uncover more of the complexity of innovation idea development in order to identify more forward-looking and strategic managerial implications. The resemblance between the generic process of idea management and the actor network translation process is noticeable. When opening up the phases and the interfaces of the process models, the difference between the actor network translation process and the generic process of idea management is substantial. Opposite to the traditional process models, the ANT translation process includes the interactions, content and changing relations between multitudes of diverse actors. In the following sections the phases and interfaces are opened up to exemplify and illustrate the perspective of ANT through an indicative analysis of empirical findings.

4.3 Empirical findings in the perspective of actor network theory

The empirical examples, used to illustrate the actor network perspective on idea processes, will be structured accordingly to the generic process model of idea management parallel with the translation process of actor network theory as mentioned in the above, in which way the complementary perspectives of idea processes through the glasses of actor networks will be visible.

4.3.1 Idea need/problematisation

A stabilised actor or actor network may be destabilised through the translation process as it is not a closed system but related to other actors or actor networks. The identification of new demands in the market, societal changes or detection of new technology as opportunities in need for new ideas in the R&D organisation, can initiate an enquiry of what is currently agreed upon as good solutions that fit the market in question. When organisations grow, develop, and seek or maintain its innovative capability, it is necessarily connected with the need of new ideas. Opportunities can come from every sort of relation in and outside the organisation.

The empirical results from the interviews, describe how organisations are trying to create these opportunities by framing new innovative spaces that can lead to new opportunities. In an interview, a global R&D manager tell about how they deliberately create problematisation by intersecting different knowledge domains inside the organisation enabling the creation of new frames of understanding technical potentials and user needs. In a radical innovation department in a global company they set up workshops with participants from different work domains in the organisation, and more importantly, from outside the organisation to map future market and technology trends in order to frame opportunity spaces or scopes of innovation idea development. These opportunity spaces create a ground for new network formations of ideas to take form. As a necessary mean for a translation process to progress in order to stabilise the network of an idea and give it enough momentum to reach the development pipeline, interessement around new ideas created on the basis of new opportunities is initiated.

4.3.2 Idea generation/problematisation-interessement

The generation of new applications of new or known technology is viewed as a problematisation of the current state in the perspective of ANT. In the data from the company survey, respondents refer to both users' needs, personal network inside and outside the company, and collaboration with close and distant colleagues as important factors when generating new ideas. Through the lens of ANT, in this situation, current understandings of users and technical applications are questioned and reframed and the actor network is creatively destabilised. The problematisation can come from any source, both from an existing as well as an unfolding relation between any types of actors; if a user points to a certain issue, a designer discover another possible application of a technology etc.

The creation of innovation ideas and their development are outcomes of synthesis between a diversity of knowledge but also unforeseen meetings through different kind of relations between individuals, things, and structures. Different sources of knowledge domains are brought together interacting with each other and results in a continuous flow of negotiations in design processes but also in engaging with the organisation in order to promote ideas and present them to corporate structures and formal procedures. In the perspective of ANT this is the beginning of the interessement and enrollment in the translation process.

4.3.3 Idea evaluation/interessement-enrollment

The evaluation phase is characterised by an interaction between evaluators and ideators and ANT show how the networks reconfigure as an outcome of the translation process in order to bring the idea forward. The foci, opinions, agendas, and goals can be very different between actors and to constructively stabilise a strong interest for the vision of the idea is very important in order to move the idea forward. The actor network perspective points at the knowledge relations, knowledge transfer and if they are sufficient enough to promote ideas, and on which levels evaluation takes place.

The case results show that a great amount of evaluating processes takes place in an informal way between ideators and closest manager but also through the personal network of the ideator in and outside the organisation. The survey results indicate that management 'takes over' in this process; hence the ownership and focus of the actor network may be displaced in some way. The understanding of the idea can be very different between designers and managers, and the actor network perspective reveals how important aspects of the idea concept can be developed in another direction then the intended one when new actors engage. It is important to make relevant choices of actors who can speak the case of the actor network and help promote it in order to improve the chance of success. The empirical results show that it is necessary to 'sell' the idea to key decision makers or to actors who have significant influence on the process.

4.3.4 Idea selection/enrollment-mobilisation

This phase of the idea process is explicitly turning to face more formal and corporate structures. This phase also describes a significant displacement in an organisational context. In the interviews, department managers tell about how top-level managers' selection of ideas is very unpredictable. This is also a phase where the actor network of the idea is given a formal project acknowledgement and it is often handed over to a different project team for product development. This transition is delicate and some organisations have good experience in letting key project members from the latter phases continue in the phases of product development.

In the interviews, it is said that handing over a project can also be met with resistance. Difficulties in handing over projects from concept development departments to product development departments are not unusual and the actor network perspective identifies important actors and relations to be aware of in managing these processes. The interviews tell, across different companies, that a general consideration is the importance of top management ownership of an idea to better the chances of successful implementation. In terms of ANT, the top management is a powerful actor who has a special ability to mobilise important actors across the organisation. But this ability may both support and hinder the stabilisation of a specific actor network.

5 DISCUSSION

In this paper we have described the complexity of innovation idea development in FEI and suggested to illuminate this complexity through an analysis in the perspective of ANT. In a related study, Legardeur et al. (2010) show how insights into the management of ideas can be gained through the use of ANT. The complexity consists of informal social interaction and sense making, engaging with technology and design, and acting with and in formal structures of an innovation organisation. The work supports our argument of the complexity that idea development encompasses and that ANT can be a useful analytical perspective.

A key challenge in the handling of front-end complexity is to address both formal and informal aspects of innovation idea development equally. ANT has shown to be capable of ordering and analyse the complexity both on formal and informal levels and light up different relevant elements and dynamics that implicate the management of idea development; which competencies to involve, what outcome of knowledge creation to focus on, and how to push new ideas and concepts through the organisation. These implications implies a more sensitive and collaborative management of ideas in terms of changing the focus from process management to the staging of creative and innovative spaces (Clausen & Yoshinaka 2007) and on supporting and challenging practices of idea processes (Gish 2011).

5.1 Outlining a new theoretical framework of idea management

The analysis has laid the ground for the outlining of a new theoretical framework of idea management. Three dimensions, *space*, *content*, and *process* are considered to be essential and comprise the theoretical framework. The dimensions are interdependent so that changes in one will cause changes in the other. The dimension of space is defined by inclusion and exclusion: what and who are in and what and who are defined outside of the idea development network. The space may be characterised through its resources, knowledge, competences, and location. Typically, all these elements include formal (management endorsement, business plan, project definitions) as well as informal (experiences, engagement, framing) aspects. Content refers to the content of the ideas produced or adopted in the space. It may be described through characteristics such as configuration, relations, requirements, quality parameters etc. Again, these characteristics contain formal aspects (requirements and standards) as well as informal aspects (meaning, experiences). Process is defined by the real movements between actors or between actors and things and may have characteristics such as creative destabilisation, constructive stabilisation, and reconfiguration. In a formal sense this may include measurable achievements, informally, we can talk of the sense of learning and movement 'whether we are getting somewhere'. The framework suggests a sensible managing of idea development by strategically including specific actors creating content in their relation to each other, and management reacting to signals from the network by strategically inputting the network to support or challenge the process of the idea networking, see Figure 1.

Small circles in the periphery of the network illustrate the dimension of space with different illustrations symbolising different actors with specific abilities, competencies, potential, and location.

The lines that connect the small circles with the big circle in the middle illustrate the specific content of the connections. These connections create the network between the actors. Process is illustrated by the arrows between the three evolving networks and symbolises the change of the network configurations throughout time through the processes of creative destabilisation and constructive stabilisation. The sensitive management is placed outside the network and stage idea development by drawing on different management tools or concepts.

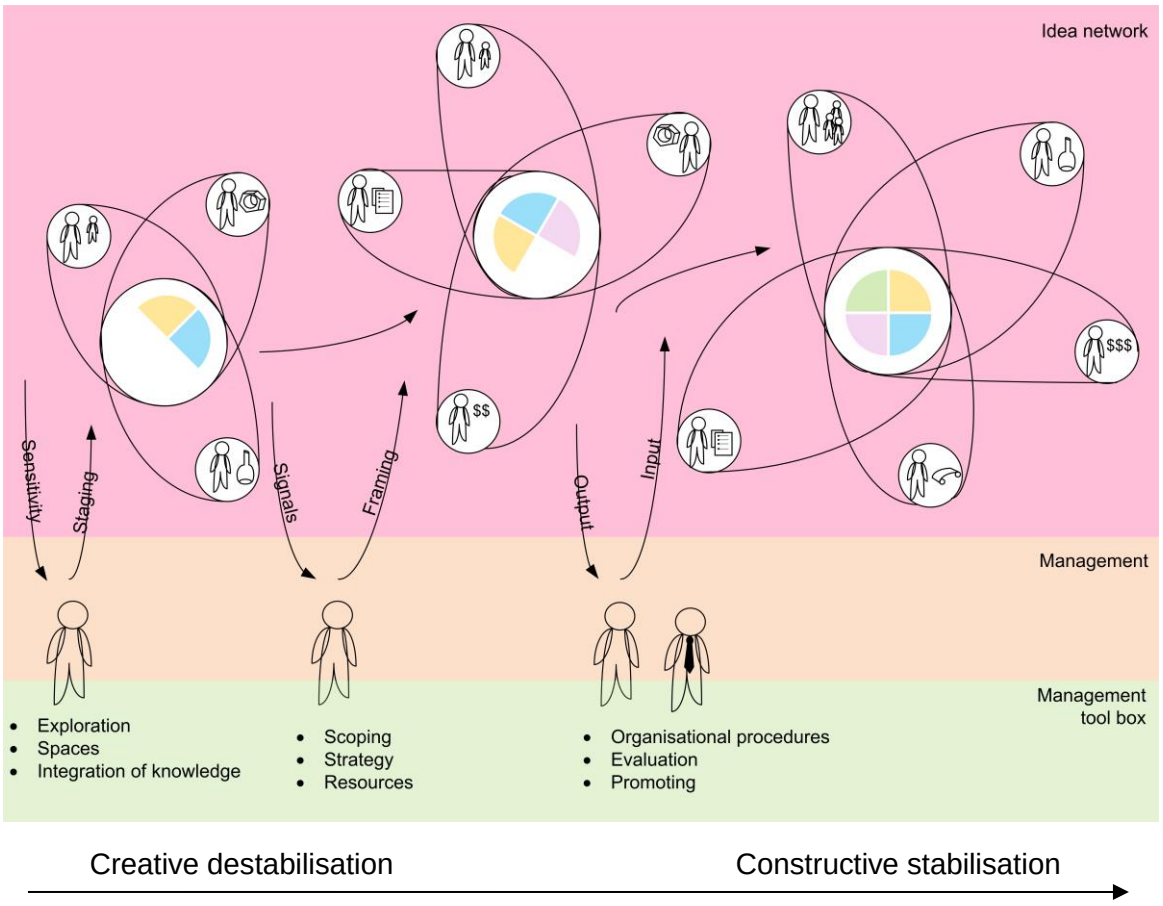

Figure 1. Initial theoretical framework of idea management illustrating how a process moves within a space from one configuration of content to another.

Dealing with innovation ideas, there is a question of when and how do ideas begin? In the perspective of the suggested framework, new ideas emerge when new relations are made in current networks and go through creative destabilisation. For the idea to become a success idea management needs to constructively stabilise the network. In the framework it implied that instead of arbitrary coincidences that sparks a new idea, it is possible to strategically create the frames and conditions for actors to create and explore new possibilities and make new relations; stage innovative spaces.

In the introduction and the literature review, challenging issues of FEI and idea management was pointed out and we would like to comment upon these regarding the proposed framework. The framework is a frame, which are added substance by relevant actors, thereby it is made situational fitting it to the context of specific FEI activities. The space is created by identifying relevant actors at different levels in- and outside the organisation as being stakeholders. The actors' sort of relations specifies the content. Thereby influential formal and informal actors and relations are considered when steering knowledge creation and pushing ideas forward in the organisation. Managers can stage the degree of exploring and exploiting activities by framing spaces including specific actors for creative thinking or for scoping of ideas. The overview of space and content in the dynamics and non-linearity of the network makes it possible to navigate the process and making decisions of idea development.

6 CONCLUSION

In this paper we argue that current views and models of innovation idea development and its managing in FEI do not have the means to engage thoroughly with the complexity of the task. In the reviewed literature, we mainly point at inadequate regards to the complexity of informal social interaction, engaging with technology and design specifications, and acting with and in the structures of an innovation organisation. We have suggested using the socio-technical perspective of ANT to bring new understanding to the managing of idea development and empirical findings have been used to illustrate this perspective. The notion of idea development as actor networks has been introduced to underline managerial implications and input the development of a theoretical framework. The framework opens up for a new understanding of idea management that aims at meeting the identified challenges of idea processes in FEI.

A more sensitising management of idea development in innovating organisations can make way for more qualified innovation ideas, at the same time recognising the complexity of different stakeholders that can either hinder or promote idea processes. A concept for managing ideas should continuously configure and reconfigure the network of idea processes by supporting and challenge it. We suggest that the management of idea development as actor networks may improve current understandings by adding a reflexive approach. We suggest that any manager of or participant in idea processes of organisations could benefit from considering: How to create a creative and supportive but also supported space, how to cater for real interactive processes which contribute to perform progress, and finally, how to ensure that the content of the idea processes meets reasonable expectations and are appreciated by stakeholders. Space, content and process should in this respect be seen as closely interlinked dimensions of idea development processes, which have to be catered for.

The intent of the final stages of the research project is to pursue the preliminary outcome presented in this paper as a springboard to a deeper empirical study in order to further develop and to some degree test a practical implementation of the suggested framework for idea management FEI.

ACKNOWLEDGEMENTS

We would like to give special thanks to the company participants involved in the empirical study.

REFERENCES

Andreasen M.M & Hein, L. (2000) *Integrated Product Devlopment*, IPU, Institute for Product Development, Technical University of Denmark, Copenhagen.

Bailey, B.P. & Horvitz, E. (2010) What's Your Idea? A Case Study of a Grassroots

Innovation Pipeline within a Large Software Company, *Proceedings Of The 28th Annual CHI Conference On Human Factors In Computing Systems*, vol. 1-4, pp. 2065-2074.

Bakker, H., Boersma, K. & Oreel, S. (2006) Creativity (Ideas) Management in Industrial R&D Organizations: A Crea-Political Process Model and an Empirical Illustration of Corus RD&T, *Creativity and Innovation Management*, vol. 15, no. 3, pp. 296-309.

Barczak, G., Griffin, A. & Kahn, K.B. (2009) PERSPECTIVE: Trends and Drivers of Success in NPD Practices: Results of the 2003 PDMA Best Practices Study, *Journal of Product Innovation Management*, vol. 26, no. 1, pp. 3-23.

Björk, J. & Magnusson, M. (2009) Where Do Good Innovation Ideas Come From? Exploring the Influence of Network Connectivity on Innovation Idea Quality, *Journal of Product Innovation Management*, vol. 26, no. 6, pp. 662-670.

Boeddrich, H. (2004) Ideas in the Workplace: A New Approach Towards Organizing the Fuzzy Front End of the Innovation Process, *Creativity and Innovation Management*, vol. 13, no. 4, pp. 274-285.

Brem, A. & Voigt, K. (2009) Integration of market pull and technology push in the corporate front end and innovation management, *Technovation*, vol. 29, no. 5, pp. 351-367.

Bryman, A. (2001) *Social research methods*, Oxford University Press, Oxford.

Callon, M. (1986) Some elements of sociology of translation: domestication of the scallops and the fishermen of St Brieuc Bay, in Law, J. (1986) *Power, action and belief: a new sociology of knowledge?,* Routledge & Kegan Paul, London.

Clausen, C., Yoshinaka, Y. (2007) Staging socio-technical spaces: translating across boundaries in design, *Journal of Design Research*, vol.6, no.1/2, pp.61-78.

Cooper, R.G. (2001) *Winning at New Products: Accelerating the process from idea to launch*, 3rd ed. Cambridge, MA: Perseus.

Coughlan, T. & Johnson, P. (2008) Idea management in creative lives, *Conference on Human Factors in* Computing Systems, pp. 3081-3086.
van Dijk, C. & van den Ende, J. (2002) Suggestion systems: transferring employee creativity into practicable ideas, *R&D Management,* vol. 32, no. 5, pp. 387-395.
Gish, L. (2011) Experiences With Idea Promoting Initiatives, *Proceedings of the 18th International Conference on Engineering Design*, pp. 83-92.
Haque, B. &James-Moore, M. (2004) Applying lean thinking to new product development, *Journal of Engineering Design*, vol. 15, no. 1, pp. 1-31.
Hellström, C., Hellström, T. (2002) Highways, Alleys and By-lanes: Charting the Pathways for Ideas and Innovation in Organizations, *Creativity and Innovation Management*, vol. 11, no. 2, pp. 107-114.
Hrastinski, S., Kviselius, N.Z., Ozan, H. & Edenius, M. (2010) A review of technologies for open innovation: Characteristics and future trends, *Proceedings of the 43rd Hawaii International Conference on System Sciences*, 1-10.
Jensen, T. E. (2003) Aktør-Netværksteori - en sociologi om kendsgerninger, karakker og kammuslinger, *Papers in Organisation*, no. 48, Copenhagen Business School.
Koen, P. A., Ajamian, G. M., Boyce, S. (2002) Fuzzy Front End: Effective Methods, Tools, and Techniques, in *The PDMA toolbook for new product development*, Wiley, New York.
Law, J. (1992) Notes on the Theory of the Actor Network: Ordering, Strategy and Heterogeneity, *Systemic Practice and Action Research*, vol. 5, no. 4, pp. 379-393.
Legardeur, J., Boujut, J. F., Tiger, H. (2010) Lessons learned from an empirical study of the early design phases of an unfulfilled innovation, *Ressearch in Engineering Design*, v. 21, n. 4, pp. 249-262.
Montoya-Weiss, M. and Tony O'Driscoll (2000) From Experience: Applying Performance Support Technology in the Fuzzy Front End of NPD, *Journal of Product Innovation Management,* vol. 17, no. 2, pp. 143-161.
Nilsson, L. & Elg, M. (2002) Managing ideas for the development of new products, *International Journal of Technology Management,* vol. 24, no. 5-6, pp. 498-513.
Pavitt, K. (2005) Innovation processes, in Fagerberg, J., Mowery, D.C., Nelson, R.R. (Eds) *Oxford Handbook of Innovation*, (pp.86–114), Oxford: Oxford University Press.
Reid, S. E., de Brentani U. (2004) The Fuzzy Front End of New Product Development for discontinuous Innovation: A Theoretical Model, Product Innovation Management, no. 21, pp. 170-184.
Selart, M. & Johansen, S.T. (2011) Understanding the Role of Value-Focused Thinking in Idea Management, *Creativity and Innovation Management,* vol. 20, no. 3, pp. 196-206.
Smith, P. G., Reinertsen, D. G. (1998) *Developing products in half the time: new rules, new tools*, John Wiley & Sons, Inc., New York.
Tidd, J., Bessant, J. (2009) *Managing innovation*, John Wiley & Sons, West Sussex.
Vandenbosch, B., Saatcioglu, A. & Fay, S. (2006) Idea Management: A Systemic View link, *Journal of Management Studies,* vol. 43, no. 2.
van de Ven, A., Engleman, R. (2004) Central problems in managing corporate innovation and entrepreneurship, *Advances in Entrepreneurship, Firm Emergence and Growth*, vol. 7, pp. 47-72.
Wang, L., Ming, X.G., Kong, F.B, Li, D. & Wang, P.P. (2012) Focus on implementation: a framework for lean product development, *Journal of Manufacturing Technology Management*, vol. 23, no.1, pp.4-24.
Wheeler, R., Burnett, R. W., Rosenblatt, A. (1991) Concurrent engineering: Success stories in instrumentation, communications, *IEEE Spectrum,* vol. 28, no. 7, pp. 32-37.
Wheelwright, S. C., Clark, K. B. (1992) *Revolutionizing product development: Quantum leaps in speed, efficiency, and quality*, Free Press, New York.